



Centerline

An Environmental News Quarterly, From the NC DOT Natural Systems Unit

Centerline Viewpoint

By: Len A. Sanderson
State Highway Administrator



In the past, creating and maintaining a transportation network and preserving the environment have seemed at cross-purposes. As we enter the 21st century, the N.C. Department of Transportation (NCDOT) must focus on how we can efficiently provide needed transportation infrastructure in an environmentally responsible manner.

In the past decade, NCDOT has experienced many growing pains as we have tried to respond to the ever-changing environmental regulations while delivering an aggressive transportation program. NCDOT has already begun to respond to this challenge through current programs and initiatives within the department, many of which have been initiated by the Project Development and Environmental Analysis Branch.

As we continue our efforts, there are several keys to our success. We must first build trust with our partners -- environmental resource agencies,

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Michaux's sumac Impacted by Construction in Wake County

By: Chris Murray, P.W.S.
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The Northern Wake Expressway and the North-South Connector are multi-lane roadway projects that are part of a regional loop which will ease traffic congestion in Wake County. Section 7 of the Endangered Species Act of 1973 (as amended) requires that all federal agencies consult with the United States Fish and Wildlife Service (USFWS) when any activity authorized, funded or carried out by that agency may affect a listed species or designated critical habitat, or is likely to jeopardize proposed species or adversely modify proposed critical habitat. These projects are partially funded through the Federal Highway Administration (FHWA), so surveys were conducted in the limits of these projects in May 1997 by NCDOT biologists.



A population of the federally Endangered Michaux's sumac (*Rhus michauxii*) was located in a successional cutover within the construction limits of the Northern Wake Expressway and the North-South Connector. This population of Michaux's sumac is the second known existing population in Wake County and contains both male and female plants. This would allow the

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consultants and contractors, and the public. This trust will develop over time through effective communication and carrying out commitments that are made throughout the project development process. Only through consistency in our actions, from planning to construction and maintenance, can we develop the kind of trust that will facilitate the project delivery process and provide quality transportation projects.

From this trust will come the ability to develop streamlined processes. These processes reach far beyond the internal workings of our department. They must be developed in partnership with the agencies that share in the collaborative decision-making process. The end result will be quicker project delivery and projects that better meet the needs of the communities.

The third key to success is our ability, as a department and as individuals, to effectively adapt to change. Because the delivery of transportation projects is so complex, we are continually confronted with changing regulations and requirements. This challenge requires a commitment of time, energy, and creativity to readily identify emerging issues and proactively adjust our processes and business practices.

As we go about our day-to-day business, each of us is presented numerous opportunities to demonstrate environmental stewardship by what we say and more importantly, what we do. It is important to make the most of these opportunities as we demonstrate our commitment to working with others – both inside and outside the department – to provide a transportation system that enhances the surrounding environment and improves the quality of life.

(Michaux's sumac continued from page 1)

potential for sexual reproduction, which is relatively rare in the majority of Michaux's sumac populations.

Michaux's sumac is historically observed in sandy or rocky soils. It is not tolerant of shade and requires periodic disturbance of its habitat to prevent formation of an over story. Without disturbance, it is gradually overtaken and eliminated by shrubs. Periodic, naturally occurring fires provided such disturbance in the past. Today, Michaux's sumac occurrences are often in areas artificially disturbed, such as railroad and roadway right-of-ways, edges of cultivated fields, and other cleared lands.

The Section 7 informal consultation process was initiated when the Michaux's sumac was discovered within the project limits. Efforts to avoid or minimize impacts to the population were not feasible and a total of 96 plants would have been destroyed by construction. The NCDOT and FHWA concluded the project would result in an adverse affect ("may affect") to Michaux's sumac. A Biological Assessment was prepared, which

evaluated direct, indirect and cumulative impacts, as well as reasonable and prudent measures to offset impacts to this population. The formal consultation process was initiated when the FHWA submitted the Biological Assessment to the USFWS for review. The USFWS issued a biological opinion that the action, as proposed, was not likely to jeopardize the continued existence of Michaux's sumac.

Conservation measures to minimize impacts to this population include: transplant stems and root cuttings to historical sites to promote increased seed production; remove stems and root cuttings for vegetative propagation studies; develop long term monitoring recommendations; and initiate study of basic reproductive biology. These innovative mitigation proposals have allowed these plants to persist and be made available for transportation and scientific studies. The future of Michaux's sumac populations in North Carolina looks improved.

**Environmental Green Sheets -
“Guidelines To Minimization Impacts To
The Environment”**

By: Staff

**This is a follow-up to the Centerline’s
April article about the newly created “Green
sheets.”**

The N.C. Department of Transportation (NCDOT) in its continuing effort to construct highway projects in environmentally sensitive areas initiated the environmental “Green Sheet” process in August 1999. As environmental issues related to transportation improvements grow more complex, a wide range of environmental commitments are often required because of endangered species laws, permit requirements, and other agreements with the regulatory agencies. These commitments are identified by a green colored sheet, which lists the environmental commitments made for a specific project. The new green sheet procedure went into effect after the NCDOT and the regulatory agencies held numerous meetings to discuss how the environmental commitments would be coordinated and implemented.

Why was there a renewed interest in the environmental commitments? During 1998-1999, approximately 10 to 12% of NCDOT projects involved protected species concerns. Some projects did not adhere to commitments made in the Section 7 process, which violated the 404 permit conditions. Some projects were in jeopardy of being shut down, causing additional consultations and escalated project costs. It was obvious to the NCDOT that the NCWRC and other regulatory agencies had lost faith in our promises. To mend this fence, NCDOT took action and implemented the green sheet process.

The Project Development and Environmental Analysis (PD&EA) Branch is responsible for preparing the green sheets for each project. The planning engineer initiates the process during the planning phase. The process begins with an initial list of commitments, which are reviewed by the resource agencies and design engineers and based on input revisions are made. The PD&EA Natural Systems Specialists are responsible for compiling and distributing the final

**East Carolina University
Researchers Evaluate
NCDOT’s Wetland
Mitigation Program
By: David Schiller
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Within North Carolina’s borders, it is generally agreed there are over five million acres of wetlands. Although the majority are located in the eastern part of the state in the relatively flat coastal plain, wetlands also occur in the mountainous western part of the state. Construction of transportation projects sometimes results in unavoidable impacts to wetlands, despite extensive and expensive measures to avoid and minimize the impacts.

In order to offset unavoidable wetland losses, the N.C. Department of Transportation (NCDOT) has implemented a major program to restore, create, enhance, and/or preserve wetlands throughout the state. Since the program’s inception in the early 1990’s, approximately 17,500 acres of mitigation properties are now at some stage of development - planning, feasibility studies, construction, or completed.

So how are we doing? Are we effective in replacing the lost functions of the impacted wetlands? To answer these and other questions, the Department has turned to two eminent wetland scientists at East Carolina University for the answers.

Drs. Mark Brinson and Richard Rheinhardt are nationally known wetland scientists who have investigated wetland systems throughout the United States. Through an agreement between the NCDOT, the Center for Transportation and the Environment, and the Department of Biology at East Carolina University, a study was initiated in 1999 to evaluate the effectiveness of our wetland mitigation program. Their science-based objective observations will assist the Department and regulatory agencies in determining future approaches to both the biological and regulatory aspects of wetland mitigation.

Workshop Held to Develop Mitigation Strategies for Wetlands and Streams

By: V. C. Bruton, Ph.D.

Staff from various branches within N.C. Department of Transportation (NCDOT), FHWA and invited on-call consultants met to discuss flexible mitigation options for wetlands, streams and riparian buffers. Because of the evolution of new and stricter environmental regulations pertaining to these natural resource types, the mitigation needs of the NCDOT have drastically increased. Traditional methods for compensating losses cannot always be implemented or may not be available. The purpose of this meeting was to explore and formulate non-traditional strategies that may be acceptable to the "regulators" as compensatory mitigation. The strategies developed during this workshop were later shared with the resource agencies.

The 47 workshop participants were divided into two work groups during the morning session. Brainstorming sessions lead by Natural Systems staff yielded a sizable list of potential alternative strategies for wetlands, streams and buffers. In the afternoon session, these ideas were consolidated and presented to workshop participants and management for discussion and consideration. From evaluations received the strategy sessions should benefit the Department. The staff from NCDOT is encouraged that there is a cooperative effort between the resource agencies, and NCDOT to develop creative strategies. New strategies will be highlighted in future Centerline publications.

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list of environmental commitments along with the permit conditions during the permit process.

To insure implementation of the green sheet process, improved communication between staff is necessary. The green sheet lists only those commitments that are "special in nature" to a particular project. Along with listing the special commitments, each NCDOT branch or division responsible for an individual commitment is designated on the green sheet.

The PD&EA Branch is responsible for distributing the NEPA commitments to design staff for inclusion in the Preliminary Field Inspection Plans. After regulatory review and design input, the revised commitments are distributed again and included in the Final Field Inspection Package. The final version of the commitments are combined with the permit special conditions to make up the green sheet, which is distributed by the PD&EA Branch as part of the permit package. The green sheets are submitted to all agencies on the permit distribution list and numerous NCDOT staff. We hope this new process will help maintain project schedules, and build assuredness from the regulatory agencies and public that the NCDOT promises are being met.

(ECU continued from page 3) The study consists of two phases—an evaluation of NCDOT's established mitigation sites and then an in-depth evaluation of six sites. During Phase I, conducted from July 1999 through June 2000, the researchers conducted field investigations of 50 established mitigation sites across the state. The draft report for Phase I will be complete soon. Field studies at the six sites selected for Phase II are underway.

Preliminary conclusions from Phase I provide some interesting and valuable information. Drs. Brinson and Rheinhardt point out that federal and state resource agencies' policies rather than science drive the general direction of wetland mitigation. Other conclusions provide more specific information that will aid NCDOT in designing and constructing more effective mitigation sites in the future. These can be summarized into the importance of planning, designing, and constructing mitigation sites that are appropriate for the hydro-geomorphic setting in which they are located.

The Phase I report is scheduled for distribution in the fall of 2000 and Phase II in the spring of 2001. The study will aid NCDOT in implementing a more effective wetland mitigation program that is acceptable from a regulatory standpoint and will meet or exceed the nation's goal of "No Net Loss" of wetlands.

Project Spotlight
US 117 from Wilson to Goldsboro
Scheduled for Construction in Fall 2000
By: Michael Wood
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The North Carolina Department of Transportation (NCDOT) recently acquired the federal Section 404 Individual Permit and the state 401 Water Quality Certification to upgrade US 117 from Wilson to Goldsboro to a four-lane highway on new location, a distance of 22 miles. The permits for this major highway project were obtained after many years of coordination with the public and environmental review agencies. There were many unique “road blocks,” which had to be overcome before the road could be built.

Once the preferred alternative was identified we began to examine ways to avoid, minimize, and mitigate impacts. This required a site specific field review with environmental agency personnel. The first task accomplished by the review team was to determine the active floodplain for the three main river systems being crossed by the highway, Black Swamp, Great Swamp, and Nahunta Swamp. These determinations were based on field indicators such as remnant rack lines and topographic breaks. This information was relayed to the engineers designing the bridges to span these areas.

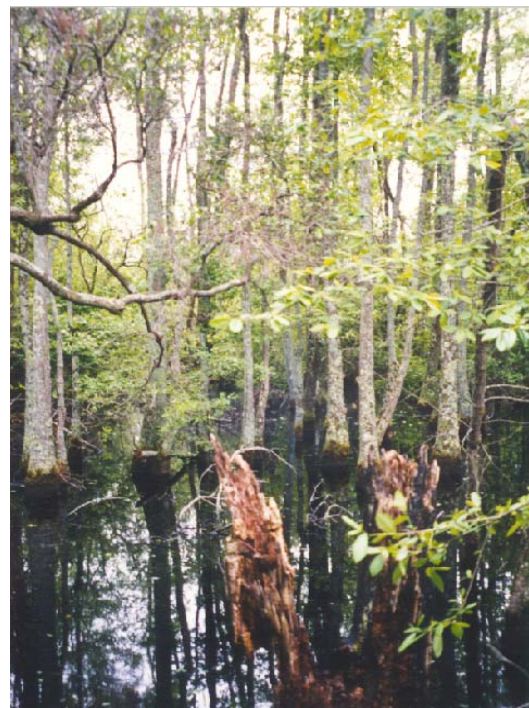
Another important aspect of the field review was visiting those areas considered high quality or unique natural resources. For example, another river system was determined to be of such high quality that it would be impossible to mitigate, so it was bridged. The road was also shifted as far as possible from the Little River to avoid impacts to anadromous fish.

The review team evaluated a large depressional wetland, which would be impacted by the road. This ephemeral wetland is quite unique due to the size (~ 7 acres) and volume of ponded water it stores. Despite the Department’s best avoidance efforts, it was impossible to avoid the entire wetland. Shifting the road to one side of the wetland, steeping fill slopes, and placing conveyance pipes under the road minimized

impacts. The entire wetland was purchased, along with a large buffer area, which will eventually be donated to a local land trust or college.

This was the first major project where NCDOT had to mitigate not only for the acreage of wetland and linear footage of stream impacted, but also acreage of “stream buffers” lost. Stream buffers, which are the 50-foot vegetated zones on either side of an intermittent or perennial stream or any other permanent water bodies, are regulated by the state Division of Water Quality and basically treated similar to wetlands for regulation purposes.

The amount of coordination required in order to gain concurrence from the environmental review agencies is lengthy and dynamic since each project is unique. It is only through the efforts of the review team, designers, and planners, that NCDOT is able to successfully design roads which will be the least damaging to our State’s natural resources.



Biological Monitoring of Streams

By: Bruce O. Ellis, CLM, PWS

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The U.S. Army Corps of Engineers, the U.S. Fish and Wildlife Service, the N.C. Department of the Environment and Natural Resources (DEHNR) require the N.C. Department of Transportation (NCDOT) to perform stream bioassessments (benthic macroinvertebrate sampling) for selected projects within the State. There are two main categories for stream bioassessments: stream mitigation/restoration projects and general impact analysis for highway projects. Stream bioassessments for both categories are conducted before construction to establish baseline conditions. Subsequent stream bioassessments are then performed during construction and post-construction. The data is analyzed and used to determine the biological success of a stream restoration project or to identify the impacts from highway construction. The duration of a sampling program for a specific project often lasts three to five years.

Most of us, who have grown up next to (in my case) a brook, river, creek, or even a small trickle, know that these special places are just filled with stuff. Fish, frogs, turtles, crayfish, mussels and many other slimy crawly things have captured our attention and imaginations. As we explored further and turned over rocks and logs we found smaller crawly things that take on almost another worldly appearance.

These smaller critters are benthic macroinvertebrates. They are an all encompassing assemblage of insect nymphs and larvae, worms, crustaceans, and mollusks that make their living in and around the substrates of aquatic ecosystems. Some of them, like the insects, spend a portion of their life cycle in the water, while others like the crayfish and mollusks live their entire lives in a small section of stream.

The benthic macroinvertebrates are an extremely diverse group of organisms, and unlike

fish, are relatively non-mobile in terms of migrating up and down a stream system. Their diversity and relative immobility make them excellent candidates for use as indicators of water quality. As an example, if you take a water sample from a stream, you are analyzing a portion of the stream at a single moment in time. You may have, in fact, missed a significant contamination event that happened days before. On the other hand, the benthic macroinvertebrates were there to experience the event, and the diversity and health of the population may have been measurably affected.

Since many benthic macroinvertebrates have stages in their life cycle which can last from six months to a year, the adverse effects of environmental stress upon the population will not be overcome until future generations. Also, different taxa of macroinvertebrates have different tolerances to pollution so long term changes in water quality conditions can be identified by population shifts from pollution sensitive to pollution tolerant organisms (and vice versa). Overall, the species present, the population diversity and the biomass are reflections of long term water quality conditions.

The science and methodologies for stream bioassessment have been developed over the decades. It is not a new science, but statistical analysis and interpretive methodologies are under constant scrutiny and evaluation. The physical collection of field data is relatively easy to learn, however, laboratory identification and interpretation is a time consuming venture that requires very specialized skills. Stream bioassessment requirements add another layer of effort to the permit process, however, it is an opportunity for a grown man to get paid to do the things he used to get punished for as a boy.

NCDOT/CTE Partnership Underscores New Environmental Research Project Awards

By Katie McDermott, CTE
and
Mohammed Mustafa, Research & Development Unit



CTE



The N.C. Department of Transportation (NCDOT) Research and Development Unit recently announced nine environmental research project awards for 2000-2001. Six of the research projects will be supported in part through preliminary engineering funds, and three entirely through SPR funds. An increased demand for environmental research combined with limited SPR funds resulted in a commitment to dedicate additional preliminary engineering monies to these new projects.

The Center for Transportation and the Environment (CTE) at North Carolina State University will play a major role in these research projects. Following its reauthorization in the Transportation Equity Act for the 21st Century (TEA-21), CTE forged a stronger relationship with the NCDOT, its longtime partner. NCDOT previously provided a 20-percent match to the Center's federal grant which has increased its commitment to 50-percent for the new grant period. One of the benefits of this strengthened

partnership is that NCDOT's environmental research program will become a CTE/NCDOT joint environmental research initiative. NCDOT will manage the proposal solicitation process and administer all projects through its existing research program. CTE's education and technology transfer programs will supply more advanced communications and information technology resources.

CTE is in the process of updating its research Web page (<http://www.itre.ncsu.edu/cte/cterip.html>) to include:

- CTE/NCDOT environmental research project abstracts
- Biographical sketches of the principal investigators
- Lists of research-related presentations and publications
- Keyword-searchable, downloadable versions of project final reports

The 1999-2000 environmental projects are already online, and the 2000-2001 project descriptions will be online by late summer.

The project listing will include:

- Assessment and Prediction of the Effects of Highways and Population Ecological and Genetic Properties of Selected Faunal Groups: The Consequences of Breakup and Isolation (UNC-Chapel Hill, \$171,019)
- Assessment of the Impact of Highway Runoff on the Health of Freshwater Mussels in North Carolina Streams (NC State University, \$238,043)
- Distribution of Freshwater Mussel Populations in Relationship to Crossing Structures (NC State University, \$182,710)
- Ecological Assessment of a Wetlands Mitigation Bank in Western North Carolina (UNC-Asheville, \$192,668)
- Effects of Shading from Bridges on Estuarine Wetlands (NC State University, \$267,825)
- Evaluating BMPs for Treating Stormwater and Wastewater from NCDOT's Highways, Industrial Facilities, and Borrow Pits (NC State University, \$344,954)
- Measures to Reduce Erosion and Turbidity in Construction Site Runoff (NC State University, \$142,464)
- Methodology to Assess Soil, Hydrologic, and Site Parameters that Affect Wetland Restoration Success (NC State University, \$849,415)
- Vegetation Management Under Guardrails for North Carolina Roadsides (NC State University, \$178,831)



**Introducing Humans Back
Into the Environment**

By: Carl Goode
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Orthodox Jews have their worship services on Saturdays. Part of their doctrine does not allow them to drive on Saturdays as well. Does this happen in North Carolina? Go up to Falls of the Neuse Road in Raleigh any Saturday morning in the vicinity of the Jewish Synagogue and watch as whole families walk on the sidewalks along the street to their services.

What does this have to do with our work, you ask? This is one example of a very important element to consider in some communities as a plan is developed for a transportation project. That the Orthodox Jewish community is very closely knit steeped in an extremely long history could play a vital role in the type of transportation system being planned. Barriers to their pedestrian movements have been a source of contention and litigation in various parts of the country.

The cry from the public for the past few years is for maintenance or an improvement for their quality of life. This has become a major transportation issue on a national level. People are very concerned about their human environment. We have long recognized and addressed the need to protect and enhance what we call the natural environment, but in so doing, we have made humans seem unnatural by default.

To address this, the N.C. Department of Transportation (NCDOT) management has decided to form a Human Environment Unit within the Project Development and Environmental Analysis Branch. This unit will be formed by enlarging the Citizens Participation Unit, adding community impact assessment and environmental justice functions and combining it with the Historic Architecture, Archaeology, and Air and Noise Sections. These groups have all been associated with the human environment and combined will be able to look at project impacts to humans more comprehensively.

Our goal is to more accurately and holistically assess project impacts early in the project development process so as to avoid

surprises and delays later. Also, we want to provide a greater opportunity for the general public to voice their wishes and concerns regarding their communities and how transportation projects may affect them. We know this is going to be a difficult and evolving process, which will require some time to fully integrate into the project development and the environmental assessment procedures. We also know that even though we have management and FHWA backing, we will need cooperation from the NCDOT and the public we serve. We look forward to the challenge of contributing to the goal of developing a fully integrated transportation decision making process.

Hurricane Preparedness Training

By: Jean Manuele,
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Wilmington District

As the Regulatory Project Manager with the U. S. Army Corps of Engineers (USACOE), I was tasked in February 2000 to investigate concerns regarding environmental issues associated with North Carolina's road maintenance activities following Hurricane Floyd. The N.C. Department of Transportation (NCDOT) had already agreed to coordinate with appropriate federal and state agencies to obtain appropriate permits before maintenance work would begin.

The scope of my investigation included: perched pipes, lack of sedimentation and erosion control, improper fill material, excavation of stream channels, filling of wetlands and confirming proper coordination with respect to federally threatened and endangered species. My investigation revealed corrective action needed to be taken in several areas. As a result, I began a series of presentations to all division bridge and road maintenance personnel to inform them about Section 10 of the Rivers and Harbors Act of 1899 and Section 404 of the Clean Water Act and how it affects the maintenance program. Recent changes in the regulatory program were also reviewed, along with how road repairs should be done following a storm such as Hurricane Floyd.

I am also coordinating efforts between USACOE and NCDOT to better understand construction practices associated with maintenance and emergency responses to natural disasters. Efforts are underway to modify the existing permitting procedures to further expedite the environmental permitting process.

Employee Spotlight

Michael Wood is a Soil Scientist with the Natural Systems Unit. Michael received his Bachelors of Science in recreation management from the University of Vermont in 1986. He went back to school at the University of Rhode Island to obtain a Masters degree in Soil Science, with a concentration in wetland coursework. While still working on his thesis, he packed up his auger and moved to North Carolina in 1994. Michael worked with the N.C. Division of Coastal Management, and received his Masters degree in 1996. During his employment with the Division of Coastal Management, Michael learned a lot about the southern flora and fauna, and the wetland ecosystems, and used this knowledge when he was assigned to work on the Charlotte Outer Loop project.

Michael Wood



Matt Haney



Matt Haney has been an Environmental Specialist since October 1999. He has worked on bridge replacement projects and natural resource technical reports, but assists his teammates with fieldwork when the opportunity arises. Matt, hailing from Goldsboro, is a graduate of North Carolina State University with a Bachelors of Science degree in natural resources, ecosystem assessment. Prior to his tour at the N.C. Department of Transportation, Matt worked with the NC State College of Forestry in their Christmas Tree genetics program. Matt was glad to have the experience, but he enjoys the biological work, which is more suited to his career path. He hopes to have an enjoyable experience and learn more about the department.

New Employee: We are excited to announce that Mary Frazer has joined the Natural Systems Unit as an Environmental Biologist II.

Mary is from Madison, Wisconsin. She worked as a Water Management Specialist with the Wisconsin Department of Natural Resources. Mary has a North Carolina connection in that she received a Masters of Environmental Management from Duke University, and has worked for the NC Museum of Natural Sciences and the National Marine Fisheries in Beaufort. Mary's education and experience will be a tremendous asset to the Branch. Please join us in welcoming Mary back to North Carolina and to the Project Development and Environmental Analysis Branch.

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Our Mission Statement

Each of the teams in the Natural Systems Unit is responsible for natural resource investigations, obtaining environmental permits, developing wetland and stream mitigation plans, and implementing the construction of mitigation sites.

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